PROJECT FACT SHEET

CONTRACT TITLE: Binary Explosive Seismic Source Development - Crosswell Seismic Forum (PARTNERSHIP)

DATE REVIEWED: 08/04/1994 **DATE REVISED:** 08/04/1994

OBJECTIVE: To evaluate the feasibility of a totally new downhole seismic source concept that will permit the imaging of oil reservoir structure and properties with much larger well separation distances and higher resolution than currently possible. A specific short term goal is to demonstrate the continuous manufacture, encapsulation, and repetitive detonation of a binary liquid explosive mixture underwater.

ID NUMBER: P-14

B & R CODE: AC0530000

CONTRACT PERFORMANCE PERIOD:
04/30/1991 to 02/28/1994
PROGRAM: Supporting Research
RESEARCH AREA:

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PROJECT SITE:
Los Alamos, NM

SCHEDULED MILESTONES:

Design & evaluation of encapsulation modifications to slapper technology	09/92
Complete search for industrial partner	09/94
Complete initiation tests at elevated pressure and temperature	11/94
Complete project	12/94

FUNDING (1000'S)	DOE	OTHER	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	1,120	0	0	**1,120**
FISCAL YR 1994	0	0	0	**0**
FUTURE FUNDS	0	0	0	**0**
TOTAL EST'D FUNDS	**1,120**	**0**	**0**	**1,120**

PROJECT DESCRIPTION: Los Alamos has been exploring the feasibility of developing a borehole logging tool intended for use as a seismic source in crosswell and potential VSP applications, that is capable of continuously manufacturing and rapidly firing explosive charges. Since at no time would explosives be present above ground, the first impediment to wide spread use of the tool would appear to be largely removed. The charges, ranging in size from 1 to 10 grams and representing 4.5 to 45 k joules of mechanical energy, would be manufactured from two non-explosive chemicals contained in a subassembly of the tool. The chemicals would be transported to a firing point outside the tool, and electrically detonated in the wellbore fluid. Because the charges can be detonated while the tool is in motion, the firing repetition rate, estimated to be on the order of 2 to 5 seconds, is only limited by the time required for transport of the explosives and electrical initiators to the firing point. Chemicals for as many as 10,000, 1-gram charges could be contained in a 4 foot subassembly in the tool; however, the maximum number of slapper assemblies which can practically be loaded into a tool of reasonable length is 1,000.

PRESENT STATUS: 1) Underwater firing of slappers and the detonation of the liquid explosive mixture tests has demonstrated the operation in wellbore fluids does not present any basic problems for the slapper/explosive system. 2) Slapper tool assemblies have been successfully tested hydrostatically to pressures of 10,000 psi (operational goals are 6500 psi, equivalent to a well depth of 15,000 feet). 3) Tests have indicated that the explosive liquid mixture is stable to at least 130 degree C and ongoing tests will establish the specific upper temperature limit of stability. 4) Initiation tests have been successfully completed to 2000 psi and 60 degrees C. Testing at higher pressure and temperature are now underway at the Energetic Materials Research and Testing Center at New Mexico Institute of Technology and Mines. 5) Upon recommendation of industrial participants in the Oil Recovery Technology Partnership project will be terminated on completion of testing if an industrial cost-share partner is not identified.

ACCOMPLISHMENTS: Selection of a liquid explosive mixture that meets initial criteria for a borehole source is complete. Detonation of the liquid explosive suitable for borehole applications with slapper detonator technology has been established. Successful design and modification of slapper technology is completed that enables detonation at high well pressures. Computer simulations show casing deformation will be less than the API mill specifications for casing drift.

BACKGROUND: Exxon research staff have shown that explosive charges perform better than other seismic sources in most reservoir imaging applications. Nonetheless, there are major impediments to the routine use of explosives for gathering borehole seismic data. The two most prevalent are assuring the safe use of explosives and the current operational limitation of firing large numbers of explosive charges for tomography applications.